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UNITED STATES DEPARTMENT OF AGRICULTURE

Harlequin Cabbage Bug

And Its Control

THE CABBAGE CROP of the southern States suffers severe losses from the ravages of the harlequin cabbage bug. The affected plants wilt and die soon after attack as though swept by fire, hence the name "fire bug." This bug also injures cauliflower, kale, turnip, radish, and other cole crops, and after destroying fields of these, attacks various other vegetables. Several generations are produced each year.

Cleaning up the cabbage stalks and other remnants as soon as the crop is off, preventing the growth of weeds and the accumulation of rubbish, using trap crops of mustard, rape, or other early crop, burning over infested patches and fields, and destroying the insects by means of a hand torch and other mechanical measures, are the best methods of control.

The first appearing bugs should be killed before they have a chance to breed, or if the fields become infested later the bugs should be destroyed late in the season so as to leave fewer to survive the winter.

Cooperation with others who grow cole crops is an absolute necessity in dealing successfully with this pest.

Contribution from the Bureau of Entomology
L. O. HOWARD, Chief
Washington, D. C. February, 1920

HARLEQUIN CABBAGE BUG[1] AND ITS CONTROL.

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CONTENTS.

INJURY TO COLE CROPS.

CABBAGE and related crops in the southern part of the United States find their most destructive insect enemy in a brilliantly colored red and black plant-bug measuring about one-half inch in length, and known variously as the "calico back," "fire bug," and "terrapin bug," as well as harlequin cabbage bug. During two periods this serious pest became abundant northward to New Jersey and at one time in Ohio, and, indeed, threatened to invade New York and New England. In recent years, however, its progress northward has been checked by extreme low temperatures.

It sucks the sap from the leaves and veins of cabbage and other crucifers, or cole crops. The affected plants wilt, wither, and die, infested gardens and fields looking as though they had been swept by fire, thus giving to the insect the name "fire bug." If permitted to propagate unmolested in seasons which favor its increase, it is certain to destroy a portion if not all of the fields which it infests. A half dozen mature insects are capable of destroying a small plant in one or two days, though a large plant will often harbor 50 or 60 mature bugs.

[1] *Murgantia histrionica* Hahn; order Hemiptera, suborder Heteroptera, family Pentatomidae.

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In years when this species has been abundant in the vicinity of the District of Columbia, the writer has seen many fields in Maryland and Virginia from which not a single good cabbage could be picked, and observed severe injury to horse-radish, collards, brussels sprouts, cauliflower, and some other crucifers. Southward, where the pest abounds every year, fields of turnips and mustard turned brown and sere from the attack of the harlequin bug are often to be seen.

This insect has been compared to the boll weevil as a pest in the South and to the San Jose scale in New Jersey. Certainly it is to the cabbage grower what the other two insects are to the cotton

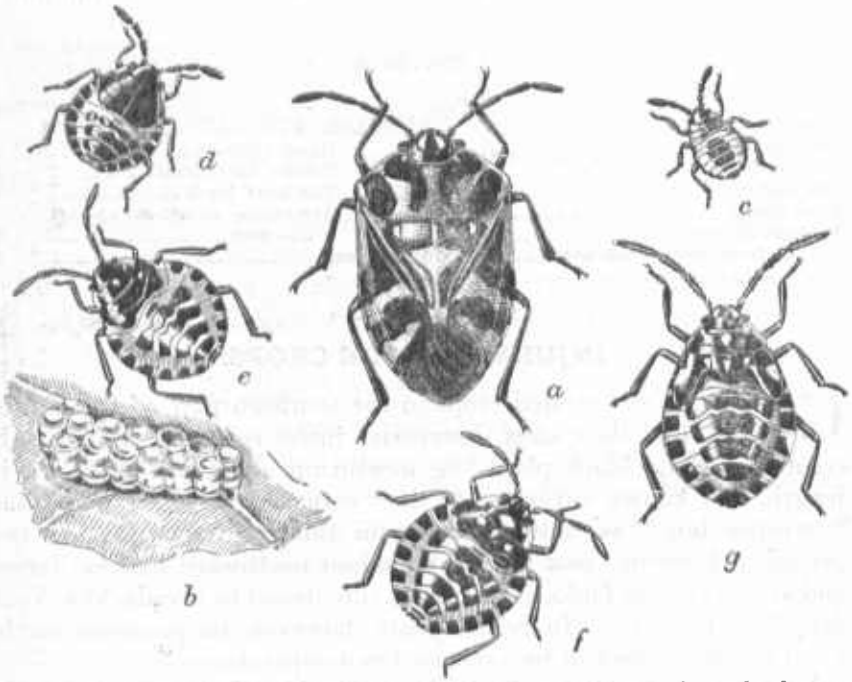

FIG. 1.—Harlequin cabbage bug: *a*, Adult; *b*, egg mass; *c*, first stage of nymph; *d*, second stage; *e*, third stage; *f*, fourth stage; *g*, fifth stage. All enlarged.

planter and fruit grower, respectively. If growers generally, however, will undertake seriously the methods of control here advised, there is no reason why it should be longer destructive in its more northern range or cause such heavy losses southward.

DESCRIPTIVE.

The name harlequin cabbage bug scarcely requires explanation to any one familiar with the insect. Its gay red or yellow and black ornamentation is suggestive of the dress of the harlequin of pantomime. In the illustration of the adult (fig. 1, *a*) the dark portions

are either black or dark metallic blue and the light portions are bright yellow in freshly transformed bugs and red in fully hardened individuals.

The eggs (fig. 1, *b*, and fig. 2) are beautiful objects, and remarkable for the fact that they closely imitate in miniature white barrels bound with black hoops and with black spots set in the proper place for bungholes. The younger stages, or nymphs, resemble the mature form, though they lack wings and have only four joints to the antennæ, whereas the adult has five. There are five nymphal stages in all (fig. 1, *c*, *d*, *e*, *f*, and *g*). In the third and fourth nymphal stages the body is hemispherical and the resemblance to a diminutive turtle or terrapin is striking.

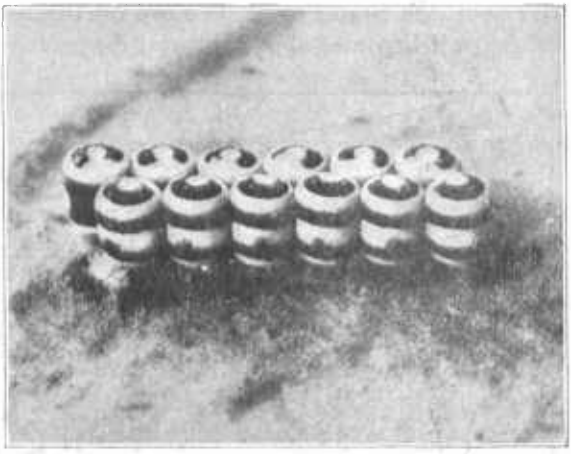

FIG. 2.—Egg mass of harlequin cabbage bug. Much enlarged.

DISTRIBUTION.

The harlequin cabbage bug is a native of Mexico and Central America. It was first recorded in the United States in Washington County, Tex., in 1864. A year or two later it had invaded Louisiana and by 1867 had appeared in North Carolina. Its spread was most noticeable along the Atlantic seaboard and up the Mississippi River Valley. In 1870 it had appeared in Missouri and Tennessee, and by 1876 had reached Delaware. In 1892 it was injurious in New Jersey, and two years later was seen on Long Island. It has also proceeded northward and westward apace and was noted in Colorado in 1882, although it had been seen in southern California as early as 1878. In the Pacific region the species is well established and it has been observed in Nevada.

This species has been diffused from a central point of dispersal, Mexico, chiefly in the following three directions: (1) From Texas eastward through the Gulf States and northward along the Atlantic seaboard to Long Island; (2) from Texas northward through the Mississippi Valley and thence through the Ohio River region into Ohio; (3) from northern Mexico into neighboring States, and from Lower California into southern California and Nevada.

This pest is practically always destructive over the entire South to tidewater Virginia, which appears to be its most northern limit as a

permanent pest. For periods of years it also causes damage much farther northward; e. g., in 1908, after a considerable period of absence, it had again reached as far north as New Jersey only to be checked by adverse climatic conditions, principally cold, so that at present, 1919, it can scarcely be found in injurious numbers in Maryland and Virginia, near the District of Columbia—this disappearance dating from 1916, when the pest was last seen in destructive abundance.

LIFE HISTORY.

Unfortunately, the seasonal history of the harlequin cabbage bug has never been carefully worked out, either in its adopted home in the Southern States or in its more northern range, where for periods of years it becomes abundant and destructive.

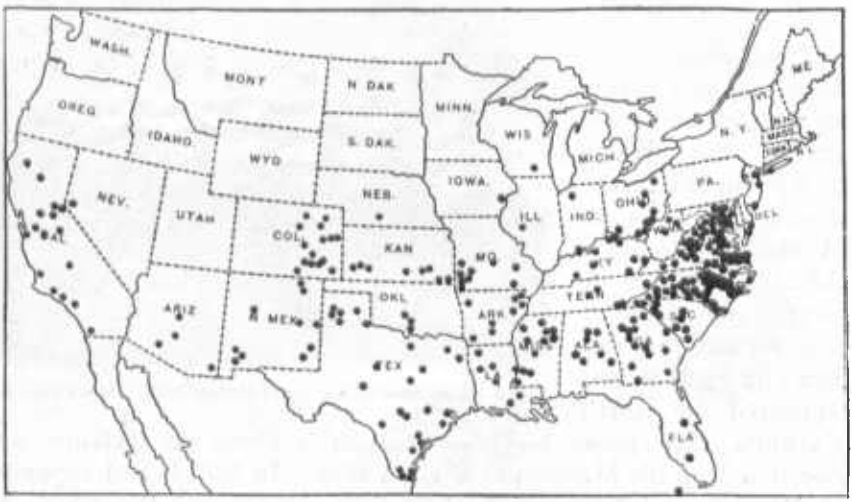

FIG. 3.—Map showing known distribution of the harlequin cabbage bug, June 1, 1919.

In the warm and equable climate of the South, where this bug is at home, it is active throughout the year. All stages have been found in southern Texas in abundance in January and February, hence they are probably found in the earlier winter months. Farther northward—for example, in and near the District of Columbia, where the writer has had this pest under observation for several years—true hibernation does not take place, but after the first severe frost of early winter the insects seek concealment in tufts of grass or under rubbish at the bases of cabbage stalks or even about the bases of the plants themselves, or in other convenient places. Although some nymphs of the last stages remain afield as late as November and December, winter is passed chiefly in the adult stage. Obviously the nymphs succumb in time to cold, as none can be found

in the early spring. Many adults also perish of cold during the winter months; warm, sunny days tempt them to feed, and sudden cold snaps which follow lead to their undoing, especially if several such climatic changes occur during winter, leaving a comparatively small percentage of the insects to begin their work of destruction the following year. The first warm days of April or May in the District of Columbia region see the bugs again afield and beginning to feed. At first wild mustard and other cruciferous weeds are attacked, and soon the insects are ready to reproduce their kind.

In the extreme South the seasonal history is different, as the insects overwinter on all winter cole crops, particularly turnips, kale, collards, cauliflower, and the like, as well as on a number of related wild plants.

The eggs are deposited on end, generally in two parallel rows, cemented together in groups of 12, as shown in figure 2. They are normally placed on the underside of the leaves, and hatch in warm weather in 3 or 4 days after deposition, or in 5 to 11 days in the cooler weather of early spring.

The young bugs or nymphs pass through their five stages of change with considerable rapidity. It has been stated that the life cycle could be completed in warm weather in about 2 weeks, but this is obviously an exaggeration, as it requires 4 or 5 weeks for the completion of the cycle in related insects.

Some specimens (from Texas) were kept under observation from the first week of March until the first week of May, under somewhat unnatural conditions, indoors, and subject to an average temperature of from 68° to 70° F. The first or egg stage covered 11 days. The first nymphal period, that is, the time from the hatching of the eggs until the first molt, was 7 days; the second, 13 days; the third, 8 days; the fourth, 14 days; while the fifth covered 17 days—a total of 70 days, or 10 weeks in all, which is not far from the maximum active period of this species. The minimum probably falls into much lower figures, probably half of this time, or at most not more than 42 days in extremely hot midsummer weather.

When cabbage and similar plants come up the insects migrate to them. It seems probable that four or five generations a year would be a natural limit in the South, and two, or possibly three, in the North.

FOOD PLANTS.

In the autumn after the cabbage crop has been made and in early winter as far north as Washington, D. C., the bugs are still active, seeming loth to seek shelter for the cold months. They cluster on cabbage stalks and sprouts and the leaves of turnips and like plants, and when the supply of these has become exhausted they will attack

almost any form of succulent vegetation which is available and palatable.

On one farm the writer observed a field of 10,000 cabbage plants completely ruined, which at the time of his visit, the first week in October, had been deserted by the bugs. An adjoining field of potatoes was then attacked, afterwards one of eggplant, and numerous

FIG. 4.—Horse-radish, showing injury by harlequin cabbage bug.

bugs in various stages were observed sucking the juices of these plants. Unripe fruit of eggplant was especially relished, and ripe pods of okra and beans were also attacked.

The list of useful plants which this species has been found to damage includes all forms of cole crops or crucifers—cabbage and related plants, kale, collards, kohl rabi, brussels sprouts (fig. 5), cauliflower, turnip, radish, horse-radish (fig. 4), mustard, rape, and the like—and when these crops have been killed out, truck crops of nearly all kinds are attacked, of which eggplant, asparagus, potato,

tomato, okra, beans, and beets are most affected. In October, several years ago, this species, after entirely destroying a half-acre plat of cabbage, was observed to attack other crops in the vicinity, including squash, late corn, grapes, and nursery plants of citrus, loquat, cherry, and plum. The bugs are also partial to weeds other than crucifers, including ragweed, pigweed, wild lettuce, and lambsquarters. They congregate on all parts of these weeds, but appear to prefer the stems.

FIG. 5.—Brussels sprouts showing characteristic feeding areas, white spots on the leaves, due to attack of the harlequin cabbage bug.

The wild food plants on which the species actually breeds include wild mustard, shepherd's purse, peppergrass, bitter cress, rock cress, water cress, sea rocket, bee plant, and practically all other plants of the mustard family, as well as some of the closely related caper family.

METHODS OF CONTROL.

In order that the best results in the treatment of the harlequin cabbage bug may be secured, preventive measures are necessary, as there is great difficulty in obtaining insecticides which are effective and which do not at the same time injure or kill the plants. These preventive measures are: (1) Clean cultural methods, especially in the fall; (2) the use of trap crops of mustard or other plants in the spring; and (3) hand methods. With correct observance of clean farming,

few of the insects will survive the following spring, and the use of trap crops will leave fewer still to be destroyed by mechanical measures. In some cases all three methods should be adopted, for if they are neglected the grower will find it a most vexatious matter to control the pest in the midst of the growing season.

CLEAN CULTURAL METHODS.

The value of clean methods of farming has been recognized by all who have had experience with this insect. The practice of leaving stalks of cabbage and other cruciferous plants in the field late in the autumn and in the early winter, and of permitting rank weeds to grow up, or, in fact, allowing any sort of rubbish to accumulate, serves as a means of protracting the life of this insect, as all such material either affords it food late in the season or provides quarters for protection against the elements during the winter. It is even inadvisable to plant crucifers in the vicinity of outhouses and barns, as the bugs are apt to enter the buildings to pass the winter.

Throughout the year wild plants of the mustard family should be carefully kept down not only in the fields but in the immediate neighborhood. A list of such plants is given on page 9.

TRAP CROPS.

Some plants, such as cabbage, collards, turnip, mustard, or kale, may be planted late, to be left at intervals in infested fields. These trap plants attract the insects in the fall, where they may then be killed with pure kerosene, or by mechanical methods.

The best remedy, however, and one that should be used by every cabbage grower who is troubled by this pest, consists in planting an early crop, which may be either mustard, rape, or kale, as a lure for the first-appearing insects. Radish and turnip serve a similar purpose. In the Gulf States the overwintered adults appear in February and March, and in the District of Columbia and vicinity in the latter part of April. For some reason they appear to prefer the plants that have been enumerated, and wild mustard and other crucifers, for the first deposition of their eggs. On these crops and on weeds the insects can be killed with kerosene or by the hand torch or may be collected in nets, or they may be destroyed by burning the entire trap crop when this is of no special value. Numerous reports have been received at the Department of Agriculture, or have been recorded elsewhere, of the value of trap crops as a means of controlling this pest.

One of the largest growers of cabbage in Delaware reported that at one time it was impossible to raise cabbage on account of this pest, but for several years he had used kale as a trap crop and as a result of this procedure and careful hand-picking of the few bugs that

strayed to the cabbage he had been troubled very little, while his neighbors' cabbage had frequently been ruined.

Some years ago half an acre of kale in Maryland became freely infested during April by harlequin bugs. The insects had all congregated on one side of the patch. Under the writer's direction this portion was burned, straw being used to facilitate ignition. Two weeks later not a single bug could be found in this patch, and the cabbage which was growing in several plats in the vicinity was entirely free from injury.

The grower should bear in mind the unusual fondness of this insect for horse-radish which, being a perennial crop, serves as a natural trap crop throughout the growing season. The foliage of horse-radish should never be neglected so that the insects are permitted to breed on it continuously. Early in the season it is advisable to kill the bugs on this crop, by hand-picking if necessary, and in the fall they can be destroyed by means of hand torches according to instructions which will be furnished farther on (p. 12). In the northern range of the insect in Virginia, Maryland, and the District of Columbia, the best time for the application of this remedy is in October, if possible before rainfall, as rains which follow the burning of the insects from the foliage will enable the plants to recuperate and take on new growth.

HAND METHODS.

If determined efforts are made to stamp out the first generation fewer insects will remain to be dealt with and very few will fly from other quarters. Thus injury may be greatly curtailed if not absolutely prevented for an entire season. The large size and bright colors of the insect and its scorn of concealment render it easy to detect, and its sluggish nature assists in its easy capture. By offering a bounty to school children for the destruction of this pest one grower in Georgia succeeded, during March and April, in destroying the first generation, and estimated that the experiment saved him $100 on his cabbage crop alone, not counting the benefit to the children.

As an instance of the ease with which this insect may be hand-picked, a Texas grower gathered, in February of one year, 47,000 bugs.

In case hand-picking has not been thoroughly done and some bugs have escaped this process and succeeded in depositing their eggs, the egg masses, which may be easily recognized by comparison with figure 2, should be carefully gathered and crushed.

CONTACT INSECTICIDES.

According to the testimony of many who have experimented with kerosene-soap emulsion, it is not effective against the adults and is only partially effective when sprayed on the younger nymphs. A 10 per cent kerosene emulsion is effective in killing the nymphs, as is also whale-oil soap, at the rate of 2 pounds to 4 gallons of water. Nicotine sulphate at the rate of a pint of a 40 per cent solution to 25 gallons of water should also be effective against the nymphs. If the insects are sprayed just after they have molted these insecticides almost invariably kill them. It is obvious that further experimentation along this line is desirable.

ARSENICALS VALUELESS AGAINST THIS PEST.

A few words should be added in regard to other insecticides. Since the harlequin cabbage bug feeds exclusively by suction and does not chew its food, arsenate of lead and other arsenicals, hellebore, and similar remedies which are useful against cabbage worms, potato beetles, and the like are *absolutely valueless* against this pest.

Pyrethrum is not effective and is, moreover, too costly.

THE HAND TORCH.

The value of the hand torch for the control of this insect has been proved by experimenters in Texas, as well as by the experience of the writer and investigators working under his direction. Its chief value is in the destruction of the insect on trap crops, although an experienced operator may safely apply it to a garden or commercial field, bearing in mind that only an instant's contact with the hot flame, i. e., sufficient to cause the bugs to drop to the ground, will so injure them, by scorching the legs and antennæ or "feelers," as to render them harmless and incapable of recovery. The brief contact necessary to accomplish this will not injure the plant.[1] Indeed, the leaves which are necessarily scorched during this process soon fall off and the plant readily takes on new growth, appearing actually to be benefited by the process. The best time to apply this remedy is in the fall in comparatively cool weather or just before harvesting the roots.

[1] Some difficulty is likely to be experienced, especially in cool or breezy weather, in securing satisfactory operation of the average plumbers' torch for this purpose, for with the low-grade gasoline now obtainable sufficient heat may not be generated to insure complete vaporization of the fuel. This difficulty is obviated by the adaptation of a vaporizing coil inclosed by the burner tube, and by this means effective operation is secured even in a strong wind.

A handy form of torch, devised for burning the spines from cactus used as stock food in the Southwest, and known as a "pear burner," is of sufficient capacity for use in comparatively large plantings infested by the harlequin cabbage bug and similar plant-bugs.[1] Its disadvantage is that it can not be applied effectively for the control of most of our common insect pests.

SUMMARY.

The systematic destruction of the insects by means of the trap-crop method described, together with a system of clean culture throughout the entire season and especially in the late fall, will leave little to be done save the gathering by hand of such insects as escape these measures or those which may fly from infested to uninfested fields.

To prevent the pest from establishing itself farther northward than its present limits, careful watch should be kept for its first appearance and the application of remedies should be prompt and thorough. The importance of killing off the first or overwintered brood of bugs and their progeny can not be too strongly emphasized.

The scrupulous observance of the methods here advised is the price of a good crop.

Cooperation with neighboring growers of cabbage and other cole crops is also an absolute necessity in the control of this pest.

[1] Pentatomidae and Coreidae.

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